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IMPROVING QUALITY THROUGH INNOVATIONS: THE ROLE OF VENTURE FINANCING AND HR SUPPORT

Abstract: *We analysed comparative characteristics of the management of quality improvement using innovations with a focus on venture financing and HR support. We revealed leading countries and the specifics of their practices in implementing innovations and studied features peculiar to Canada, Sweden and South Korea. The study of the state, dynamics, and indicators of HR support, venture financing and product quality allowed us to establish the connection and identify the conditions of its absence. The latter is explained by the influence of additional factors, which are certain barriers to the implementation of promising innovative projects in quality improvement. We also established that among the given factors the most negative factor is the insufficient level of equipment modernisation.*

The goal of this research was to identify the relationship between the improvement of the quality of products (services) and an increase in the use of innovations that are connected with venture financing and HR support.

The scientific novelty of this research is due to the determination of the models of improving quality through innovations in the leading countries in the context of venture financing, HR support and high-tech production.

Keywords: *Venture financing, startups, HR support, Improving quality, Innovations, Innovative companies, High-tech production.*

1. Introduction

The emergence of new products with high consumer qualities and services that are in high demand due to their uniqueness in the market is connected with the improvement of quality. Growth of quality is impossible with equal market opportunities and technological and HR resources of companies, while innovative solutions help ensure it. Innovations could be implemented with the help of investing. Its long-term character allows for R&D and approbation of new samples of products and diagnostics of the market advantages of services.

Covering the expenditures presented in the business plans of new projects in high-tech production is possible through the use of effective forms of financing. The focus on venture financing allows accumulating talented human resources (Nestorov et al., 2023), purchasing innovative equipment and

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technologies and creating products (services) with new consumer parameters of quality. This type of financing is most widespread in economically developed countries, for it is rather risky and cannot be realised with limited financial capabilities. The attraction of private national and foreign investors to the projects of venture financing is more accessible in developed countries because they have sustainable regulatory and legal guarantees of investors' rights.

Venture financing requires quality management of capital and a justified business plan, with forecast indicators of effectiveness within the main spheres. The potential of the personnel of companies that implement innovative projects is important for the achievement of all designated tasks and goals in the context of the growth of product quality through ensuring higher consumer qualities or developing completely new products with unique characteristics. Digitalization and AI technologies provide new opportunities for raising quality, creating new parameters of quality, and achieving energy and resource effectiveness as the indicators of quality and price. Corporate management information systems are used in the new conditions of digitalization. They ensure interaction at the level of all components of the strategy (Kadesnikova et al., 2023). Knowledge and skills in the use of new types of technologies are required for the execution of the main processes, application of corporate management information systems, and development of unique product samples. The change in technologies and equipment for production must not be an obstacle given their functional complexity. Personnel must have basic technological and technical knowledge to master new skills very quickly. Accordingly, digital readiness and qualification are top-priority qualities of labour resources, while initiative and creativity are elements of HR support of projects and could be considered a unique advantage of companies. Given the above, it is important to assess the influence of such innovative directions as venture financing and HR support of projects on the improvement of the quality of products (services) of companies.

The goal of this research was to identify the relationship between the improvement of quality and an increase in the use of innovations connected with venture financing and HR support. Within this goal, we designated the following tasks: determining the list of countries that demonstrate the largest volumes of venture financing and HR support of innovative projects and assessing the influence of two innovative directions (HR support and venture financing) on the improvement of quality.

2. Methodological basis of the research

To achieve the designated tasks, we used a particular methodological basis for the research. HR support was studied based on the data on international rankings of countries by the indicator of Research talent, % in businesses, which is published in the annual report by WIPO (2024). The indicator of venture financing is assessed based on the indicator of Venture capital (VC) investors, deals/bn PPP$ GDP, according to WIPO (2024). At present, there are no world rankings that would demonstrate countries' positions by the quality of products (services). Therefore, we assessed this indicator through High-tech manufacturing, %, according to WIPO (2024).

To establish the specifics of the studied problems, we systematised and analysed scientific approaches to the connection between venture financing and HR support and the level and opportunities for the growth of product quality.

Silva et al. (2023) analysed the importance of financing the improvement of knowledge and skills of personnel who participate in the implementation of innovative projects of companies (including the ones connected

with venture financing). According to the scholars, Canada has a sustainable practice of financing innovative projects, which involves also preliminary support for the improvement of the quality of knowledge and personnel training. This approach is agreed with the Sustainable Development Goals.

Jeong et al. (2020) considered the features of value creation of innovative companies in South Korea, which implement start-ups and receive venture financing at different stages of the project's life cycle. The authors contributed to the study of the issue of ensuring venture financing of start-ups depending on the stage of their formation and the level of basic knowledge and skills. The scholar presented comparative characteristics of the possibilities of receiving venture financing at the initial stage and the stage of implementing innovations.

An (2023) dwelt on the state and dynamics of venture capital in South Korea and venture companies' approaches to decision-making regarding investments in start-ups. The scholar stated that ensuring the effectiveness of companies' activities depends on a range of factors, namely optimality of approaches to the criteria of selecting the objects of financing (start-ups); sources of capital of these subjects; and policy of management of investment risks. The experience of South Korea in the management in the context of venture financing is formed around the market participants' focus on the government's actions in determining the top-priority directions of investing.

Nitani and Nusrat (2023) analysed the role of small and medium companies in Canada in ensuring the population's employment. According to the authors, despite this business environment's subject being the key actor in Canada's employment, it does not have effective access to financing. This is especially true for innovative companies that realise start-ups in high-tech production (improvement of the parameters of product quality or creation of new samples).

Glücksman (2020) analysed modern features of venture financing of start-ups in Sweden given the existing practice in the information support of venture companies and borrowers (innovative companies). According to the scholar, the practice of venture financing is characterised by asymmetry in each party's information about priorities and specifics of each other's interests. The absence of exhaustive knowledge of innovative companies regarding the processes and problems of venture financing leads to difficulties in the implementation of projects and insufficient effectiveness. In Canada, venture companies' main priority is effectiveness and compliance with their partner's responsibilities. The practical value of this research consists in recommendations regarding the improvement of communication between innovative companies and venture companies, which includes openness of partnership, complex study of the process of venture financing by innovative companies, determination of complex aspects and possible problems and assessment of the correspondence of the conditions of venture companies to the specifics of implementation of the start-up.

Elamir et al. (2024) presented empirical and theoretical substantiation of the connection between the quality of the management school and the level of implementing innovative projects and drew parallels between these variables and aspects of the level of higher education and the ranking of higher educational establishments. According to the authors, HR support for start-ups is possible in the case of the existence of a quality school of management in the country.

We should mention the contribution of Veselovsky et al. (2018) to the formation of the theoretical substantiation of approaches to the functioning of corporate innovative systems, which are based on high quality of management within the key components of

management. Special attention should be paid to the authors' recommendations regarding the structure of the management of quality in the conditions of innovative companies' functioning (Jovičić et al. 2023). These recommendations are relevant for the subjects of the innovative market that are aimed towards the implementation of start-ups and their financial and HR support.

Even though there is a sufficient volume of theoretical and empirical materials about the considered components, it is important to determine a range of features of their development in the selected leading countries in venture financing. An important role in the assessment of this influence belongs to the identification of the connection between these indicators and the improvement of quality.

3. Experimental setting and methods

The experimental setting of this research includes the data on countries that are presented within the considered ranking indicators according to WIPO (2024): Canada, South Korea and Sweden.
To achieve the objective of this research, we selected the following methods.

The ranking analysis was used to identify the list of countries with the highest level of the considered indicators.

The method of systematisation was used to establish the advantages of the influence of innovations in the context of venture financing and HR support on product quality in the selected countries.

The method of induction enabled us to determine the features of the formation of the influence of the considered components on the level of product quality in manufacturing companies in the selected countries.

The method of comparison was utilised to compare the indicators in the regional context.

4. Results

Let us determine the leading countries in dependence of the indicator of improvement of product quality on the improvement of the level of innovations which are connected with an increase in venture investing and HR support.

As shown in Table 1 (see Appendix), the selected indicators are in mutual dependence. When they do not provide the expected effect, there are objective reasons. In this case, we may note the example of the United Arab Emirates. Despite the impact of HR support and venture financing, the growth of product quality was not ensured due to insufficient business initiatives in the modernisation of technologies and equipment.

Attention should be paid to the experience of ensuring product quality in the Canadian industry. Assessment of empirical data of Silva et al. (2023) shows that Canada has three categories of persons who are interested in the creation of conditions for implementation of innovations for HR support. These are subjects that contribute to the social financing of innovations. Silva et al. (2023) demonstrated that as of year-end 2020, this financing equalled USD 2.3 trillion. The main categories of these subjects are as follows:

- Organisations that invest in social financing as financial intermediaries. In this case, these are investment funds and banks that manage assets. These subjects contribute to the implementation of projects for the improvement of knowledge and skills;

- Organisations and establishments that are aimed at the achievement of the Sustainable Development Goals. These are mainly unions, parties and organisations that promote environmental and socioeconomic goals. They influence the government, society and subjects of the business environment, stimulating them to invest in social and environmental development. These structures are not responsible for

independent training of personnel to raise the level of knowledge and experience.;

- Subjects that independently invest in the social sector, ensuring the following HR support of innovative projects. These subjects are aimed at the achievement of the Sustainable Development Goals and hope to receive a return on investments in knowledge and the creation of a favourable environment for the life activities of labour resources.

Canada is an economically developed country, with a high level of investor protection and a stable regulatory and legal basis that guarantees their rights and interests. Canada practises venture financing of start-ups, despite a rather high level of risks of investing in this direction. For the effectiveness of start-ups, conditions for quality HR support (innovative initiatives, their realisation in the form of new products, improvement of the parameters of quality of the existing products, etc.) are created. Though the Canadian economy is a highly developed one, new innovative companies (including small and medium) do not have a sufficient level of access to financing compared to similar subjects in the USA. This is due to the specific features of the country's financial market. Based on the materials by Nitani and Nusrat (2023), we revealed that access to financing below USD 5 million is rather problematic in Canada. Canadian innovative companies face high credit rates if they need such loans, and venture companies are very selective regarding the objects of investing.

Let us analyse the specific features of improvement of product quality due to investments in the sphere of venture financing and HR support at companies in South Korea.

Analysis of empirical data (Jeong et al., 2020) shows that the form of venture investing in start-ups, which involves the provision of investments at the initial stages, dominates in the country. This approach allows innovative companies that have a high potential in R&D, new knowledge and skills to ensure high effectiveness of the start-up development. Such subjects have a lower level of risk due to the presence of knowledge in the selected sphere of innovative activities due to the support of personnel who have sufficient experience and training. South Korea also has innovative companies that deal with start-ups without highly qualified and talented personnel. Therefore, such business subjects have more risks and fewer opportunities for receiving venture financing at the initial stages. This category of companies that implements start-ups in high-tech production accounts for a small share of the innovative participants of the start-up market in South Korea and receives venture financing at the stage of implementation of new types of products. According to An (2023), over 2017-2021, the share of venture capital in financing of start-ups in South Korea grew from 0.4 % to 2.2 %. Though this indicator is rather small compared to the government's participation (from 84.9 % in 2017 to 64.1 % in 2021) and bank establishments (from 12.3 % in 2017 to 28.2 % in 2021), it demonstrates growth due to the reduction of government's role in support of national innovative companies. This fact is connected with an increase in the quality of HR support, which is the basis of effective management of projects within South Korean start-ups. We see a certain shift in the sources of financing for innovations due to the reduction of their risk level, which is connected with the growth of start-ups that have a high level of personnel training. The government passes the possibility of participation in support of innovative entrepreneurial initiatives to the sector of venture companies.

Sweden uses the approach to venture financing, which is based on rather complex criteria for the selection of investing objects. Accordingly, innovative companies experience difficulties in receiving funds for the realisation of projects. Growth of venture investments due to an increase in the number

of innovative companies is expected by early 2025 (Statista, 2024). Compared to early 2024, this indicator is expected to grow by 125 %. Venture financing at later stages dominates in the country. It is less profitable for innovative companies compared to financing at early stages. This practice is caused by venture investors' focus on the selection of more stable participants in the innovative market. It is rather difficult for innovative companies to achieve forecast goals regarding an increase in quality (or creation of unique samples) and achievement of the growth of effectiveness in these conditions. In the early stages of innovative projects, there is a need for financial assets for R&D and production of test samples, etc. These processes require start-up capital, which is sought from the banks in the form of high-interest loans. Receipt of venture financing at the following stages does not allow achieving optimal economic effectiveness.

5. Discussion

The research results enable us to identify the models of the management of venture financing and HR support, which are used within start-ups that are oriented towards the creation of new samples of products (services) and new parameters of quality.

We should note the application of the intellectually-oriented model, which is financed at the initial stages of start-ups. Due to high HR support, this model involves lower financial risks and a higher level of effectiveness. The specific features of personnel, involved in innovative projects with this form of venture financing, include the following: knowledge and experience of participation in similar projects; creativity; productiveness; motivation, supported by the material components; high resilience and sustainability of teamwork with new employees who have their views and large experience of participation in the innovative projects in a certain sphere. This model, which ensures an increase in quality and leads to the growth of the share of high-tech production, is peculiar to South Korea.

There is a model of модель venture financing based on the initial efficiency of start-ups. We do not think that this model can contribute to high HR support, because the attraction of highly qualified and creative employees requires initial financial investments. Accordingly, innovative companies cannot be similarly effective in the context of improvement of quality or creation of unique samples of products, compared to companies that can have financing at the initial stages of projects. This model is applied in Canada and Sweden. Despite a sufficiently high ranking of venture financing and quality of industrial products, these countries do not demonstrate significant advantages in the creation of attractive conditions for the functioning of innovative companies.

6. Conclusions

Summing up this research, we should note that such directions of innovative development of industrial companies as venture financing and creative HR support may in some cases have a similarly positive effect on the achievement of projects' goals in the improvement of quality (or creation of its new parameters). Sometimes these innovative advantages do not provide the expected results. This might be because participants of the innovations market use models that are acceptable for conditions that do not conform to the existing conditions. Companies that are oriented towards the development of new types of products and improvement of quality and consumer features of the existing samples sometimes do not take into account the specifics of the technological and technical state of their production and neglect the need for modernisation. Thus, an important direction for ensuring effectiveness in the sphere of product quality improvement with a focus on innovations of HR support and venture financing is the adaptation of their

production and research platforms to the existing models of management or the creation of new models that would take into account all aspects and priorities of project management.

Quality HR support is very relevant for the implementation of innovations in the improvement of quality and development of new types of products (services). A high level of knowledge, creativity, commitment and focus on results are peculiar to talented employees with sufficient experience. All these qualities might be absent with young employees who do not have experience with start-ups. Therefore, innovative companies' focus on venture financing at early stages is a more acceptable option for subjects that strive towards stable growth during the implementation of innovations.

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Appendix

Table 1. Dynamics of the selected indicators of the innovative development of the selected countries

	Country	Research talent, % in businesses	Venture capital (VC) investors, deals/bn PPP$ GDP	High-tech manufacturing, %	Characteristics
1	France	2024: ranking - 10, % - 61.7 %; 2023: ranking - 11, % - 61.8 %; 2022: ranking - 9, % - 62.9 %.	2024: ranking - 24, volume – USD 0.3 billion; 2023: ranking - 24, volume – USD 0.3 billion; 2022: ranking - 20, volume – USD 0.2 billion.	2024: ranking – 14, % - 46.2 %; 2023: ranking - 12, % - 48.8 %; 2022: ranking - 10, % - 52.1 %.	No significant changes in the innovative initiatives in HR support, venture financing, or share of high-tech products
2	Belgium	2024: ranking - 9, % - 62 %; 2023: ranking - 8, % - 64.3 %; 2022: ranking - 18, % - 56.8 %.	2024: ranking - 16, volume – USD 0.4 billion; 2023: ranking - 20, volume – USD 0.3 billion; 2022: ranking - 22, volume – USD 0.2 billion.	2024: ranking - 23, % - 42.1 %; 2023: ranking - 18, % - 45.9 %; 2022: ranking - 21, % - 44.2 %.	Improvement of the innovative initiatives of HR support in 2023 led to the growth of venture investing in 2023-2024. The volume of high-tech products increases. We see the direct connection between the components.
3	Canada	2024: ranking - 8, % - 62.8 %; 2023: ranking - 14 % - 60.5 %; 2022: ranking - 16, % - 58.4 %.	2024: ranking - 13, volume – USD 0.5 billion; 2023: ranking - 12, volume – USD 0.5 billion; 2022: ranking - 11, volume – USD 0.5 billion.	2024: ranking - 36, % - 31.8 %; 2023: ranking - 34, % - 34.7 %; 2022: ranking - 34, % - 36.8 %.	With the improvement of innovations in the sphere of HR support and the absence of improvement in venture financing, the medium level of the volumes of high-tech products and product quality in the country is supported.
4	Austria	2024: ranking - 7, % - 63.7 %; 2023: ranking - 9, % - 63.3 %; 2022: ranking - 8, % - 62.9 %.	2024: ranking - 22, volume – USD 0.3 billion; 2023: ranking - 23, volume – USD 0.3 billion; 2022: ranking - 25, volume – USD 0.2 billion.	2024: ranking - 19, % - 44.5 %; 2023: ranking - 19, % - 45.7 %; 2022: ranking - 17, % - 45.8 %.	High indicators of HR support did not demonstrate serious fluctuations. No significant changes in the indicators of venture financing and volumes of high-tech products.
5	Netherlands	2024: ranking - 6, % - 75.2 %; 2023: ranking - 6, % - 70.2 %; 2022: ranking - 3, % - 74.7 %.	2024: ranking - 12, volume – USD 0.5 billion; 2023: ranking - 16, volume – USD 0.4 billion; 2022: ranking - 27, volume – USD 0.1 billion.	2024: ranking - 21, % - 43.6 %; 2023: ranking - 15, % - 47.4 %; 2022: ranking - 6, % - 70.5 %.	Direct connection between the reduction in HR support and product quality.

6	Japan	2024: ranking - 5, % - 75.2 %; 2023: ranking - 5, % - 75.1 %; 2022: ranking - 3, % - 74.7 %.	2024: ranking - 31, volume – USD 0.2 billion; 2023: ranking - 27, volume – USD 0.2 billion; 2022: ranking - 27, volume – USD 0.1 billion.	2024: ranking - 9, % - 54.6 %; 2023: ranking - 8, % - 54.6 %; 2022: ranking - 9, % - 55.2 %.	With the high and stable indicator of HR support, a high level of product quality is retained. The level of venture financing demonstrated a slight growth with a small decrease in the ranking.
7	Sweden	2024: ranking - 4, % - 77.4 %; 2023: ranking - 4, % - 77.6 %; 2022: ranking - 5, % - 71.8 %.	2024: ranking - 14, volume – USD 0.4 billion; 2023: ranking - 15, volume – USD 0.4 billion; 2022: ranking - 14, volume – USD 0.3 billion.	2024: ranking - 13, % - 47.1 %; 2023: ranking - 14, % - 47.4 %; 2022: ranking - 13, % - 48.8 %.	High indicators of HR support and venture financing ensure high quality of products.
8	United Arab Emirates	2024: ranking - 3, % - 77.4 %; 2023: ranking - 3, % - 77.6 %; 2022: ranking - 2, % - 77.9 %.	2024: ranking - 18, volume – USD 0.4 billion; 2023: ranking - 18, volume – USD 0.3 billion; 2022: ranking - 19, volume – USD 0.2 billion.	2024: ranking - 62, % - 20 %; 2023: ranking - 42, % - 29.3 %; 2022: ranking - 47, % - 26.4 %.	Growth of product quality was not ensured due to insufficient modernisation of technologies and equipment.
9	USA	2024: ranking - 2, % - 81.3 %; 2023: ranking - 2, % - 80.4 %; 2022: ranking - 4, % - 72.3 %.	2024: ranking - 17, volume – USD 0.4 billion; 2023: ranking - 13, volume – USD 0.4 billion; 2022: ranking - 12, volume – USD 0.4 billion.	2024: ranking - 22, % - 43.2 %; 2023: ranking - 24, % - 42.4 %; 2022: ranking - 20, % - 44.3 %.	High HR support and a high level of venture financing support a medium level of high-tech products in the total volume of production.
10	South Korea	2024: ranking - 1, % - 82.6 %; 2023: ranking - 1, % - 82.9 %; 2022: ranking - 1, % - 81.8 %.	2024: ranking - 28, volume – USD 0.2 billion; 2023: ranking - 34, volume – USD 0.1 billion; 2022: ranking - 34, volume – USD 0.1 billion.	2024: ranking - 4, % - 58.2 %; 2023: ranking - 7, % - 56.2 %; 2022: ranking - 8, % - 56.3 %.	A high level of HR support and growth of venture financing led to the gradual growth of product quality.
11	Germany	2024: ranking - 12, % - 61.5 %; 2023: ranking - 15, % - 60.1 %; 2022: ranking - 12, % - 60.2 %.	2024: ranking - 26, volume – USD 0.3 billion; 2023: ranking - 25, volume – USD 0.2 billion; 2022: ranking - 24, volume – USD 0.2 billion.	2024: ranking - 5, % - 57.5 %; 2023: ranking - 9, % - 52.9 %; 2022: ranking - 7, % - 56.8 %.	High positions in HR support and a medium level of venture financing ensure a stable share of high-tech products in the total volume of production and ensure quality.

12	Ireland	2024: ranking - 33, % - 44.4 %; 2023: ranking - 31, % - 45.5 %; 2022: ranking - 19, % - 55 %.	2024: ranking - 20, volume – USD 0.4 billion; 2023: ranking - 22, volume – USD 0.3 billion; 2022: ranking - 18, volume – USD 0.2 billion.	2024: ranking - 3, % - 66.6 %; 2023: ranking - 6, % - 58.5 %; 2022: ranking - 6, % - 58.5 %.	With the medium level of venture financing and a medium level of HR support, the growth of high-tech productions and product quality was ensured due to the modernisation of technologies and equipment.
13	Singapore	2024: ranking - 21, % - 54.2 %; 2023: ranking - 19, % - 54.2 %; 2022: ranking - 21, % - 52.2 %.	2024: ranking - 1, volume – USD 2.7 billion; 2023: ranking - 3, volume – USD 1.9 billion; 2022: ranking - 1, volume – USD 1 billion.	2024: ranking - 1, % - 82 %; 2023: ranking - 1, % - 78.5 %; 2022: ranking - 1, % - 74.7 %.	A stable medium indicator of HR support was accompanied by the growth of venture financing, which led to an increase in the volumes of high-tech products and product quality.
14	Switzerland	2024: ranking - 28, % - 48.7 %; 2023: ranking - 27, % - 48.3 %; 2022: ranking - 28, % - 48.3 %.	2024: ranking - 9, volume – USD 0.8 billion; 2023: ranking - 9, volume – USD 0.7 billion; 2022: ranking - 9, volume – USD 0.5 billion.	2024: ranking - 2, % - 71.5 %; 2023: ranking - 2, % - 67.3 %; 2022: ranking - 2, % - 67.3 %.	With the stable medium level of HR support and high level of venture financing, growth of product quality was ensured.

Source: Compiled by the authors based on (Lee, et al., 2024; WIPO, 2023; WIPO, 2022; He, et al., 2024; Fastercapital, 2024; Carmin and Magagnin, 2024; Fendoglu and Xu, 2024; Wheeler, 2023)